

SOV/112-59-3-4713

8(6)

Translation from: Referativnyy zhurnal. Elektrotehnika, 1959, Nr 3, p 58 (USSR)

AUTHOR: Voronko, Ye. A.

TITLE: Construction of Electric Generating Stations in the Urals
(Stroitel'stvo elektrostantsiy na Urale)

PERIODICAL: V sb.: Energ. str-vo SSSR za 40 let. M.-L. Gosenergoizdat,
1958, pp 367-372

ABSTRACT: The following data is presented: a review of development of the Urals' raw-energy sources from 1913 up to date; detailed figures characterizing mechanization in various branches of work; cost of work per one ruble of cost of mechanisms; examples of new erection methods using assembled reinforced-concrete constructions, large-unit erection, etc. In 1958, 200-Mw turbines and 640-ton/hour, 230-atm, 610°C boilers are expected to be installed at the Urals electric generating stations.

V.V.M.

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SOV/97-58-8-9/13

AUTHORS: Voronko, Ye.A., Mints, V.B. and Voznesenskiy, V.A.,
Engineers

TITLE: Investigations of Deformation, Crack Formation and
Elastic Properties of Shell Concrete (Issledovaniya
deformativnosti, treshchinostoykosti i uprugikh svoystv
armotsementa)

PERIODICAL: Beton i Zhelezobeton, 1958, Nr 8, pp 308 - 311 (USSR)

ABSTRACT: Shell concrete could be used for making various facing
slabs. The shell concrete is actually a slab formed from
fine-concrete mix reinforced with steel mesh. In 1957,
a covered market place was constructed using spherical
"shell concrete" slabs spanning 15 m. The All-Soviet
Institute Orgenergostroy designed spherical shape shell
concrete slabs spanning 12 m, and also slabs for warehouses
and other buildings spanning 24 m. Various tests were
carried out to ascertain the physical and mechanical
properties of these concrete slabs by the factory for pre-
cast reinforced concrete of the Kuybyshevgidrostroy. The
test samples were 1 200 x 475 mm in plan and 10 cm thick.
Altogether, 30 various testing samples were investigated,

Card1/4 ranging in thickness from 8 - 16 mm reinforced with

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300 - 500 kg/m³ of shell concrete. Portland cement Mark 500 was used for these tests. 1 000 kg cement/m³ of sand was used and the water/cement ratio was 0.24-0.3 (GOST 3100-51). Woven steel mesh was used as a reinforcement. The wires were of 0.7, 1.2 and 2.4 mm in diameter and the mesh squares 8 x 8 mm. The average strength of the mesh is

36 kg/mm². Slabs were cast into metal moulds and the consolidation of the concrete was carried out by vibrator I-7 for a period of 3 to 4 minutes, after which the surface was trowelled by cement grout. Some of the testing samples were cured for 8 hours at a temperature of 55 - 60 °C and some were hardened under normal conditions. From the mechanical properties of the shell-concrete, the tensile limit of elasticity in bending was determined. The test sample was loaded by four forces and the experiments were carried out in a specially prepared rig consisting of a load-bearing frame on which were placed cross pieces, with supporting shafts, which transmit the loads. The loading Card2/4 on the specimen was achieved with heavy rollers connected by

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Properties of Shell Concrete

a system of wires and pulleys to the loading arm. Loading was carried out by equal steps causing a stress of $10 - 12 \text{ kg/cm}^2$ up to a total stress of 200 kg/cm^2 , after which the step was increased to three times its previous size. Each step was held for 10 minutes when loading and 15 minutes when unloading. The specimen was examined and measurement made of the width of the cracks at each stage in the zone between the extreme supports. In accordance with the assumption of Professor Nervi that concrete reinforced with thin steel mesh in a quantity of $400/500 \text{ kg/m}^3$ behaves as a homogeneous material, all calculations were made by methods of formulae developed for such materials. The relation between the deflection and the load is linear in the first stages of the experiment, showing that the material is still in the elastic regime. From the deflection, the modulus of elasticity can be derived. The modulus at certain limiting stresses remains constant, which confirms that shell-concrete, as a homogeneous material, behaves elastically for stresses which in certain

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cases can reach 150 kg/cm^2 . Moreover, the region of constant modulus increases as its absolute value decreases. The modulus of elasticity increases as the diameter of the reinforcing wire decreases. These deductions can aid in the choice of shell-concrete for the building under consideration. Thus, for example, for structures where rigidity and stability are the criteria, a high modulus shell-concrete must be used reinforced with thin steel mesh. The relation between the width of the crack and the stress is also discussed in detail. Initially, the cracks develop slowly but later new cracks appear while the earlier ones do not grow wider. Shell-concrete is highly stable to crack formation. The cracks develop parallel to each other transversely to the reinforcing wire at a distance one from the other equal to that between the wires of the mesh. Shell-concrete is more elastic than ferro-concrete. There are 6 figures and 2 tables.

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VORONKO, Ye.A., inzh.; MINTS, V.B., inzh.; VOZNESENSKIY, V.A., inzh.

Testing strain capacity, elasticity, and crack resistance of
reinforced cements. Bet. 1 zhel. bet. no. 8:308-311 Ag '58.
(MIRA 11:8)

(Cement--Testing)

37195
S/560/61/000/011/001/012
EO52/E514

3.2430
3.2100
AUTHORS:

Mandel'shtam, S.L., Tindo, I.P., Voron'ko, Yu.K.,
Vasil'yev, B.N. and Shurygin, A.I.

TITLE:
SOURCE:

Studies of solar X-ray emission. II
Akademiya nauk SSSR. Iskusstvennyye sputniki Zemli.
no.11. Moscow, 1961. Rezul'taty nauchnykh
issledovaniy, provedennykh vo vremya poletov vtorogo
i tret'yego kosmicheskikh korabley-sputnikov, 3-14

TEXT:
Zemli, no.10, Izd-vo AN SSSR, 1961, p.12) the authors reported
measurements of the intensity of solar X-ray emission below 10 Å
which were carried out with the aid of geophysical rockets. In
the present paper they report the corresponding results obtained
with the second and third Soviet spaceships on August 19-20 and
December 1-2, 1960. The aim of the measurements was to investi-
gate the intensity over an extended period of time (of the order
of a day or two). Preliminary results have been given by the
authors in another paper (Ref.2: Dokl. AN SSSR, 140, 1058, 1961).
The second spaceship carried six end-window photon counters
(15 mg/cm² beryllium foils) with an oxygen-neon quenching mixture.

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* S/560/61/000/010/002/016

Studies of solar X-ray emission.II S/560/61/000/011/001/012
E032/E514

These counters were developed under the direction of I. A. Prager and S. M. Perel'man. The counters had a sensitivity of between 0.1 and 0.2 pulses/photon in the wavelength range 3-7.5 Å. The counters were mounted so that their axes were oriented along six directions at equal angles to each other; the field of view of each counter was 45°. The telemetric record showing the counting rate as a function of time is reproduced. It is estimated that the flux of radiation in the range 2-10 Å, which was recorded during the flare of August 19 (15 hr 33 min) was of the order of $7 \cdot 10^{-3} - 1.5 \cdot 10^{-2}$ erg cm⁻² sec⁻¹. The apparatus mounted on the third spaceship was somewhat modified. Three types of probes were employed so that the solar radiation below 10 Å could be continuously monitored together with interference due to radiation-belt particles. The main detectors were two parallel-connected CBT-9 (SBT-9) counters with mica windows (1.6 mg cm⁻²) and located in a lead screen 1 mm thick. The counters were supplied by solar batteries. In addition, there were two "control counters" which were mounted at right angles to the direction of the sun. A tantalum plate was placed in front of the counter

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Studies of solar X-ray emission.II S/560/61/000/011/001/012
E032/E514

windows and served as a target for the radiation-belt particles. The counters were practically insensitive to solar X-ray radiation. A third pair of counters was mounted on the outersurface of the third spaceship. These counters were similar to those carried by the second spaceship. The aim was to estimate the spectral energy distribution by comparing the indications of the beryllium and the mica counters. The telemetric record obtained with the aid of the third spaceship is reproduced. It is estimated that the flux of radiation below 10 \AA was $2.5 \cdot 10^{-4} \text{ erg cm}^{-2} \text{ sec}^{-1}$. Moreover, the intensity of radiation in this spectral region remained constant within $\pm 20\%$ during the observations. This was due to the fact that on December 1-2, 1960 the sun was very quiet and there was only one flare (importance 1^+). The question of the flux and the energy of the particles recorded in these experiments is being examined at the present time. There are 10 figures and 2 tables.

SUBMITTED: June 26, 1961

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3.2430(1482,2806)

172450
AUTHORS:

TITLE:

SOURCE:

TEXT:

This is the first of 3 investigations on X-radiation in the range below 10 \AA carried out by research rockets and the 2nd and 3rd Sputniks. Provisional results of these measurements were set forth in brief in an earlier study. Experimental method: The measurements described in the present article were carried out during the flight of 2 research rockets. The prime object of the measurements was to accumulate experimental data and to develop a method for subsequent measurements by means of

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D299/D302

Mandel'shtam, S. L., Tindo, I. P., Voron'ko,
Yu. K., Shurygin, A. I., and Vasil'yev, B. N.

Study of solar X-radiation. I. Geophysical-
rocket measurements

Akademiya nauk SSSR. Iskusstvennyye sputniki
Zemli. no. 10. Moscow, 1961, 12-21

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Study of solar...

earth-satellites. As detectors, photon counters were used, as these are more sensitive in the spectral range $< 10 \text{ \AA}$ than vacuum photomultipliers. The sensor unit was placed on the instrument container which turned automatically towards the sun. Special precautions were taken to ensure that no corpuscular radiation should interfere with the measurements. In the first launching, the sensor unit incorporated 2 similar counters directed towards the sun; one of the counters had a magnetic shield, and the other had none. In the second launching, both counters had magnetic shields, but the second counter was at an angle of 15° towards the sun, recording non-solar radiation only. Standard counters of type CBT-9 (SBT-9) were used. The characteristics of the counters are described. The counting rate was calculated from the telemetered data. The 2 rockets were launched on July 21, 1959, in the morning and evening respectively. On that day, the solar activity was intense. Results: A figure shows the dependence of the counting rate on altitude.

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A considerable X-ray flow was recorded from altitudes of 95 km up. Owing to the stability of orientation of the container with respect to the sun, it was unnecessary to make allowance for the angular dependence of counter efficiency. From the counting-rate data, the energy distribution and the magnitude of the energy flux outside the atmosphere were calculated. The data processing was based on the expression $m_{incl} = m_{vert} \Phi(z)$,

where m_{incl} is the mass of an inclined air-column of 1 cm^2 cross-section lying between the apparatus and the sun, m_{vert} -- the mass of a vertical column equal to the atmospheric pressure at the given altitude, and $\Phi(z)$ is determined by the zenith angle of the sun z . A figure shows the counting rate as a function of m_{incl} . Assuming the spectral region under investigation to be continuous, it is possible to construct the photon-distribution curve by means of the counting-rate curves, the mass

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Study of solar...

coefficients of absorption of air, and the spectral-sensitivity curve of the counters. A figure shows the photon-distribution curves as a function of wavelength. The energy distribution in the morning and evening launchings was found to differ by a factor of 3. It is difficult to ascertain whether this difference is real. The main source for the continuous radiation is electron bremsstrahlung in the field of hydrogen and helium ions. The obtained electron temperature considerably exceeded the value of $T_e \sim 1 \div 3 \times 10^6$ °K obtained in subsequent investigations by space-ships. A comparison of measurements conducted by Friedman (in 1953) during a minimum-period of solar activity with the authors' measurements (in December 1960, by space-ship) after a maximum-phase showed that the temperature and intensity of radiation are greatly dependent on the phase of the sun cycle. As the above-described rocket investigations were carried out for very low positions of the sun above the horizon (in contra-

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distinction to Friedman's investigations), further systematic measurements are required. In ensuing articles, the results of measurements carried out on the 2nd and 3rd Sputniks will be given, as well as a description of the electronic equipment. There are 11 figures and 20 references: 8 Soviet-bloc and 12 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: G. Elwert, J. Geophys. Res., 66, 391, 1961; H. Friedman, Trans. Intern. Astr. Un., 10, 706, 1960, Cambridge Univ. Press; T. A. Chubb, H. Friedman, R. W. Kreplin, J. Geophys. Res., 65, 1831, 1960; R. W. Champion, R. A. Minzner, Plan. and Space Science, 1, 259, 1959. X

SUBMITTED: May 17, 1961

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3.2420 (1049, 1482)

29115

S/020/61/140/005/01-022
B104/B102

AUTHORS: Vasil'yev, B. N., Voron'ko, Yu. K., Mandel'shtam, S. L.,
Tindo, I. P., and Shurygin, A. I.

TITLE: Preliminary results of a study of solar x-radiation by means
of rockets and space ships

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 5, 1961, 1058-1061

TEXT: By means of two geophysical rockets (July 21, 1959, altitude 105 km), the second space ship (August 19-20, 1960, altitude of perihelion 305 km, aphelion 320 km), and the third space ship (December 1-2, 1960, perihelion 180 km, aphelion 249 km), solar radiation in the spectral range below 10 \AA was studied. End-window photon counters with aluminum coated (2μ) mica windows (1.6 mg/cm^2 , $d = 4 \text{ mm}$) were attached outside the apparatus container which left the rocket and turned automatically to the sun. By means of magnetic systems, the windows of counters were shielded from 15-20 kev electrons which might cause bremsstrahlung. At an altitude of 95 km, the counting rate of counters oriented toward the sun increased. This radiation was considered to be

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an x-radiation. Using data of V. V. Mikhnevich et al. (Izv. AN SSSR, ser. geofiz., no. 11, 1393 (1957)) results of measurement were extrapolated for the boundary of atmosphere. Radiation fluxes ($2 \cdot 10^8$ Å) obtained were $7.3 \cdot 10^{-4}$ and $3.2 \cdot 10^{-4}$ erg/cm².sec. On the second space ship, six end-window photon counters with beryllium windows (0.1 mm thick, 7 mm in diameter) were used. Counters were arranged vertical to each other. The counting rate amounted to some thousand pulses/sec when the counters were exposed to solar radiation. On that part of the orbit which was in the earth's shadow it was some ten pulses/sec (cosmic background), and reached high values only when the orbit approached the outer radiation belt. From the results of measurements in the shadow-region, the authors concluded that a radiation from the radiation belt did not occur below $30-40^\circ$ north and $20-30^\circ$ south. A radiation flux of $7.6 \cdot 10^{-4}$ erg/cm².sec was obtained. On the third space ship, two counters with mica windows (1.6 mg/cm^2 , $d = 4 \text{ mm}$) covered on both sides with aluminum foils (5μ) were switched in parallel. These two counters were oriented toward the sun. Two other counters of the same type were arranged vertical to the former. Tantalum plates were located in front

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Preliminary results of a...

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of the windows of these control counters. They recorded radiation caused by slowing down electrons in the tantalum plates. In the instrument container two other beryllium window counters were installed. Thus, it was possible to separate the background of x-radiation caused by electrons from the solar x-radiation. An x-radiation flux of $2.4 \cdot 10^{-4}$ erg/cm².sec was obtained in the range 2-10 Å. The electron temperature of solar radiation in the spectral range investigated was estimated to be $\sim 2 \cdot 10^5$. I. S. Shklovskiy (Izv. Krymsk. astrofiz. obs., 4, 80 (1949)), T. V. Kazachevskaya and G. S. Ivanov-Kholodnyy (Astr. zhurn., 36, 1022 (1959)), S. N. Vernov and A. Ye. Chudakov (Usp. fiz. nauk, 70, no. 4, 585 (1960)), and L. V. Kurnosova et al. (Sborn. Iskusstvennyye sputniki Zemli, no. 10 (1961)) are mentioned. There are 4 figures and 7 references: 5 Soviet and 2 non-Soviet. The three most recent references to English-language publications read as follows: T. A. Chubb, H. Friedman, R. W. Kreplin, J. Geophys. Res., 65, no. 6, 1831 (1960); H. Friedman, Astronautics, no. 11, 42, 128 (1960); J. A. Van Allen, L. A. Frank, Nature, 183, 430 (1959).

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Preliminary results of a...

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ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev of the Academy of
Sciences USSR)

PRESENTED: May 24, 1961. by D. V. Skobel'tsyn, Academician

SUBMITTED: April 19, 1961

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VORONKO, Yu. K.

MANDELSTAM, B. L., VASILYEV, B. N., VORONKO, Yu. K., TIMMO, K. P., SHURAYEV, A.

"Measurements of Solar X-ray Radiation"

Soviet Papers Presented at Plenary Meetings of Committee on Space Research
(COSPAR) and Third International Space Symposium, Washington, D. C.,
23 Apr - 9 May 62

MANDELSHTAM, S. L., TINDO, I. P., VORON'KO, Yu. K., VASILYEV, B.N., and SHURYGIN, A. I.

"The Intensity of The X-ray Radiation of The Sun Near The Short-Wave
Edge of The Spectrum"

report presented at the 13th Intl. Astronautical Federation Congress (FAI)
Varna, Bulgaria, 23-29 Sep 1962

S/020/62/142/001/015/021
B104/B102

AUTHORS: Mandel'shtam, S. L., Voron'ko, Yu. K., Tindo, I. P.,
Shurygin, A. I., and Vasil'yev, B. N.

TITLE: Study of solar X-ray emission during the total solar eclipse
on February 15, 1961

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 1, 1962, 77-80

TEXT: The shortwave range ($< 10 \text{ \AA}$) of the solar spectrum was examined with photon counters described in previous papers of the authors (DAN, 140, no. 5, 1058 (1961); Sborn. Iskusstvennyye sputniki Zemli, (a) no. 10, 1961, p. 13; (b) no. 11, 1961, p. 3). A. P. Lukirskiy helped in determining the spectral sensitivity of the apparatus at the Leningradskiy gosudarstvennyy universitet (Leningrad State University), using a method of Lukirskiy, M. A. Rumsh, and L. A. Smirnov (Optika i spektroskopiya, 9, 505 (1960)). The counters had been developed under the supervision of I. A. Prager and S. M. Perel'man. The counter block was mounted on the outside of the instrument container of a geophysical rocket. The counters always faced the Sun. The container reached an altitude of about 96 km. The emission

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of the solar corona is continuous in the spectral region in question and has no intense lines. The energy distribution of solar emission and the energy flux in the spectral range under consideration were determined from the variations of the count rate with altitude, with the spectral sensitivity of the counters, and with the mass absorption coefficient of air (Fig. 3). The emission of the totally covered corona in the spectral range in question had an intensity of $4 \cdot 10^{-4}$ erg/cm²·sec. The shortwave part of the solar spectrum is emitted from all those parts of the corona, in which the 5303 Å line is also excited. There are 4 figures, 1 table, and 7 references: 4 Soviet and 3 non-Soviet. The two references to English-language publications read as follows: G. Elwert, J. Atm. Terr. Phys., 12, 187 (1958); J. Geophys. Res., 66, 391 (1961).

ASSOCIATION: Fizicheskii institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

PRESENTED: July 4, 1961, by A. A. Blagonravov, Academician

SUBMITTED: June 27, 1961

Card 2/12

MANDEL'SHTAM, S.L.; VASIL'YEV, B.N.; VORON'KO, Yu.K.; TINDO, I.P.;
SHURYGIN, A.I.; FETISOV, R.N.

"Of the short-wavelength end of the sun spectrum by means of
satellites and rockets."

Report presented at the Spectrascopicum, 11th Intl. *Colloq.*
Belgrade, Yug, 30 Sep - 4 Oct 63.

L 17159-63

EWI(1)/FCC(w)/FS(v)-2/BDS/EEC-2/ES(v) AEDC/AFFTC/

ASD/AFHDC/ESD-3/APQC

Pe-4/Pg-4/Pi-4/Pl-4/Po-4/Pq-4

TT/ET

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ACCESSION NR: AT3006863

S/2560/63/000/015/0085/0091 96

AUTHOR: Vasil'yev, B. N.; Shurygin, A. I.; Tinder, I. P.;
Voron'ko, Yu. K.

TITLE: Study of x-ray radiation from the sun. III. Electronic equipment

SOURCE: AN SSSR. Iskusst. sputniki Zemli, no. 15, 1963, 85-91

TOPIC TAGS: radiation, solar radiation, x-ray, x-ray radiation, solar x-ray radiation, counter, radiation counter, Geiger counter, telemetry, telemetry transmitter, TM transmitter, satellite, sputnik 6, sputnik, sputnik 5

ABSTRACT: A detailed description is given of x-ray measuring equipment carried on Soviet geophysical rockets and later on Sputniks 3 and 6 (animal-carrying satellites of August and December 1960), whose purpose was to record soft x-ray radiation from the sun using photon counters of the Geiger type. The rockets had one counter

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continuously oriented toward the sun and a reference counter set 15° away from the sun. ⁷Sputnik 5 carried six identical counters, hard-mounted outside the instrument compartment on opposite ends of three mutually orthogonal axes and all feeding into a common counting and storage channel. Sputnik 6 carried three variants as follows: 1) sun-tracking counters with mica windows; 2) sun-tracking reference counters, also with mica windows, which recorded bremsstrahlung from sun-oriented tantalum deflection plates; and 3) two fixed counters with beryllium foil windows. Each counter set fed its own counting and storage circuitry as shown in Fig. 1 of the Enclosure. In general, a Geiger counter output was fed to a blocking oscillator pulse-shaping stage, then to binary trigger elements and divider stages, and finally to the telemetry encoding unit and/or memory stage. The main difference between the rocket and sputnik systems was that the former had no storage but telemetered the count continuously, whereas the sputniks could store the count over a daily period and transmit it on command from a ground station. In the sputniks the memory circuitry registered a count every three minutes; thus the difference

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ACCESSION NR: AT3006863

between two successive total counts on readout yielded a mean count rate. Sputnik 5 was able to transmit the current count directly in addition to storing it; Sputnik 5 did not have this direct transmission feature. The pulse shapers, triggers, dividers, and encoders were transistorized and mounted as separate subassemblies in a hermetically sealed container connected to the Geiger counter. Schematics are given for each of these stages, together with descriptions of circuit functions, including temperature compensation to ensure stable operation over the $\pm 50^\circ\text{C}$ range. Performance limits of the counter systems were as follows: 1) rocket mounted counters had an impulse rate of 0.1 to 3000 per sec; 2) Sputnik 5 counters had an impulse storage rate of 0.1 to 5000 per sec and a total storage capacity of 2^{20} pulses; and 3) Sputnik 6 counters had an impulse storage rate of 0.1 to 5000 per sec and a total capacity of 2^{17} pulses for the mica aperture counter and 2^{20} pulses for the beryllium aperture type. A functional diagram of a Sputnik counter system is shown in Fig. 2 of the Enclosure. "The authors thank the project's director Prof. S. L. Mandel'shtam. The authors also thank M. A. Minayev, V. F. Sukhanov and I. T. Shapovalov who participated in the preparation and operation of the devices described."

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L 33282-66 EWT(1)/FSS-2 TT/OW

ACC NR: AR6017229

SOURCE CODE: UR/005B/65/000/012/D023/D023

AUTHORS: Mandel'shtam, S. L.; Vasil'yev, B. N.; Voron'ko, Yu. K.; Tindo, I. P.; Shurygin, A. I.; Petisov, Ye. N. 64
B

TITLE: Investigations of the short-wave end of the solar spectrum with the aid of satellites and rockets 12

SOURCE: Ref. zh. Fizika, Abs. 12D177

REF SOURCE: Tr. Komis. po spektroskopii. AN SSSR, t. 3, vyp. 1, 1964, 36-54

TOPIC TAGS: solar spectrum, solar corona, solar radiation, geophysic rocket, scientific satellite

ABSTRACT: The radiation of the sun was investigated experimentally and theoretically in the spectral region below 10 Å. It is established that this radiation has a continuous spectrum and is due to recombination of electrons and "heavy" ions in the solar corona. The measurements of the electron temperature of the radiating regions of the corona in different experiments yielded values between 1.5 and 4 x 10⁶ °K; the flux of radiation at the limit of the earth's atmosphere is 2 - 8 x 10⁻⁴ erg/cm²-sec. [Translation of abstract]

SUB CODE: 03, 22/

Card 1/1 *Py*

L 0041-45

ACCESSION NR. 124044155 5/2181/64/006/009/2739/1000

AUTHOR: Volon'ko, Yu. K.; Zverov, G. M.; Meshkov, D. D.; Stairnov, A.

TITLE: Investigation of optical and paramagnetic resonance spectra of Er^{3+} in CaF_2

SOURCE: Fizika tverdogo tela, v. 6, no. 9, 1964, 2709-2800

TOPIC TAGS: rare earth compound, electron paramagnetic resonance, light absorption, luminescence, calcium fluoride laser, crystal symmetry, Stark splitting

ABSTRACT: In view of the need of detailed information on the properties of crystals containing rare-earth ion admixtures, which are used for lasers, the authors investigated the electron paramagnetic resonance (EPR) spectrum, the optical absorption, and the luminescence of crystals of CaF_2 doped with Er^{3+} and grown by different

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ACCESSION NR: AP4044955

methods. The luminescence and absorption spectra were obtained at 4.2 and 77K using DPS-13 and DPS-8 spectrographs and the IKS-12 spectrometer. The EPR study established the symmetry of the surrounding of the Er^{3+} ions in these crystals. Two types of crystals were grown, one in a fluoriding atmosphere at a pressure which did not ensure complete removal of the oxygen impurities, and one at a pressure high enough to eliminate the oxygen. The erbium concentration in the crystals was ~0.1%. The EPR data show that there are at least four essentially different types of Er^{3+} centers, having different surrounding symmetries and different crystalline field strengths. The EPR method makes it possible to study all these ions separately. On the other hand, the optical spectra yielded lines corresponding to all possible symmetries of the surrounding of the Er^{3+} ions in the spectra. To relate the two methods, the spin-lattice relaxation of the Er^{3+} ions in the CaF_2 was measured at 2-45K, and the distances to the nearest excited Stark components of the lower level of these ions were determined. These data were

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used in the analysis of the optical spectra. In addition, a theoretical interpretation of the level splitting in the crystalline field is presented (in the cubic-field approximation) for Er^{3+} ions in a tetragonal surrounding. "The authors are grateful to A. M. Prokhorov for interest and to V. V. Osiko for valuable discussions." Orig. art. has: 6 figures, 3 formulas, and 3 tables.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 18Apr64

ATO PRESS: 3110

RECL: 00

SUB CODE: OP, SS

NR RHP NOV: 004

OTHER: 114

Card 3/3

L 22571-65 EPF(c)/SPR/ENT(m)/ENP(b)/EMP(t) Pr-4/74-10 TTP(c) JM/JD
 ACCESSION NR: AP5003446 S/0181/65/001/001/0267/0273

AUTHOR: Voron'ko, Yu. K.; Osiko, V. V.; Udovanchik, V. T.; Furshov, M. M.

TITLE: Optical properties of calcium fluoride doped with triply ion-
 ized dysprosium

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 147-173

TOPIC TAGS: calcium fluoride, absorption spectrum, emission spectrum, luminescence, laser material, laser dysprosium, rare earth element, luminescence center

ABSTRACT: The absorption, emission, and excitation spectra of CaF_2 doped with Dy^{3+} were investigated using samples which differed in chemical composition and in their growth conditions. It was found that there are at least three types of Dy^{3+} doped CaF_2 crystals. The differences can be attributed to a set of optical centers characteristic of each type of crystal. Centers of tetragonal symmetry characterize Type I crystals and centers of trigonal symmetry, Type II. The center structure of type III crystals could not be determined. It was

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L 22571-65

ACCESSION NR: AP5003446

established that electronic transitions of Dy^{3+} centers correspond to electronic transitions of the free ion. The oxygen impurities in the Dy^{3+} ion are responsible for the appearance of specific absorption bands in the short-wavelength ultraviolet part of the spectrum. Investigation of the optical properties of chemically different Dy^{3+} doped CaF_2 crystals has shown that the crystals are rarely mixtures of more than one type. Orig. art. has: 5 figures and 2 tables. (CS)

ASSOCIATION: Fizicheskiy institut imeni P. N. Lebedev (Physics Institute)

SUBMITTED: 09May64

ENCL: 00

SP. CODE: SS

NO REF SOV: 002

OTHER: 001

ATD PRESS: 3172

Card 2/2

L-50955-66 EWT(m)/T/EWP(t)/ETI IJP(c) JW/JD/JG

ACC NR: AT6020041

(A) SOURCE CODE: UR/2564/65/005/000/0383/0290

AUTHOR: Voron'ko, Yu. K.; Osiko, V. V.; Fursikov, M. M.

ORG: none

TITLE: The study of the structure of $\text{CaF}_2\text{-Sm}^{3+}$ crystals by optical means

SOURCE: AN SSSR. Institut kristallografii. Rost kristallov, v. 5, 1965, 383-390

TOPIC TAGS: crystal optic property, crystal absorption, crystal growing, calcium fluoride

ABSTRACT: The present paper reports on studies of absorption, luminescence, and excitation spectra of a large number of $\text{CaF}_2\text{-Sm}^{3+}$ crystals grown under various conditions with the aim of establishing a fast method for the study of the structure of fluorite crystals. An analysis of the results shows that in $\text{CaF}_2\text{-Sm}^{3+}$ crystals there are basically three types of optical centers the relative concentration of which depends on the conditions under which the crystals were produced. If no oxygen admixtures are present, the crystals contain a single type of centers (I) of tetragonal symmetry, as determined by P. P. Pashinin of the Oscillation Laboratory of the Physics Institute, AN SSSR, (Laboratoriya kolebaniy Fizicheskogo instituta AN SSSR) using electron paramagnetic resonance. These centers consist of $\text{Sm}^{3+}\text{-F}^{1-}$ ion pairs located at one of the

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L 36955-66

ACC NR: AT6020041

nearer internodal points. Type II centers have a trigonal symmetry and seem to consist of Sm^{3+} - O^{2-} ion pairs. The structure of type III centers is not yet understood. Orig. art. has: 3 figures and 1 table.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 004/ OTH REF: 003

Card

2/2

ACC NR: AP7000005.

SOURCE CODE: UR/0070/66/011/006/0936/0938

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Fursikov, M. M.

ORG: Physics Institute im. P. N. Lebedev (Fizicheskiy institut);
Institute of Crystallography, AN SSSR (Institut kristallografii AN SSSR)

TITLE: Cerofluorite with neodymium admixture as active laser material

SOURCE: Kristallografiya, v. 11, no. 6, 1966, 936-938

TOPIC TAGS: crystal laser, laser optic material, laser emission,
calcium fluoride, fluorite, cerofluorite, absorption spectrum,
luminescence spectrum

ABSTRACT: Preliminary data were reported on absorption and luminescence spectra and stimulated emission of neodymium activated cerofluorite ($\text{CaF}_2\text{—CeF}_3$) crystals. The material was selected for the study because earlier studies of the mixed fluoride crystals of elements of groups II and III indicated the possibility of obtaining laser action with a low (~ 10 J) generation threshold at room temperature. The cerofluorite crystals activated with 0.5—1.0 wt% Nd were grown by a method previously described [A. A. Kaminskiy, V. V. Osiko. Neorganicheskiye materialy, 1, 2043, 1965]. Crystal rods ~ 45 mm long and ~ 55 mm in

Cofd 1/2

UDC: 548.0:535:80

ACC NR: AP7000005

diameter were used in the experiments. Very broad peaks characterized the electronic spectra of cerofluorite crystals as of the similar mixed fluoride crystals. The peaks were unresolved even at 77K. Spiked output was obtained on the $\lambda 10657 \text{ \AA}$ line from the cerofluorite crystal activated with $\lambda 1.0\%$ Nd at a pump energy of $\lambda 50 \text{ J}$ delivered to an IFP-800 xenon flash lamp. The cavity was formed by confocal spherical mirrors with dielectric coating. Width of the emission line was $\lambda 3 \text{ cm}^{-1}$ for an excitation energy nearly equal to the threshold energy. Generation characteristics of the crystal were not inferior to those of the best $\text{CaF}_2\text{---Nd}^{3+}$ crystals, although the cerofluorite crystals used were optically heterogeneous. Energy transfer between different optical centers of Nd was assumed to be the mechanism of the generation mode. Orig. art. has: 2 figures.

SUB CODE: 20/ SUBM DATE: 27Nov65/ ORIG REF: 008/ OTH REF: 003/
 ATD PRESS: 5107

Card 2/2

L 46107-66 EWT(1)/EWT(m)/T/EWP(L)/ETI LJP(c) JD/JW/GG
 ACC NR: AP6023908 SOURCE CODE: UR/0363/66/002/007/1161/1170

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Prokhorov, A. M.

ORG: Physios Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskii institut Akademii nauk SSSR); Institute of Crystallography, Academy of Sciences, SSSR (Institut kristallografii Akademii nauk SSSR)

TITLE: New type of crystals for lasers with optical excitation

SOURCE: AN SSSR. Izv. Neorg materialy, v. 2, no. 7, 1966, 1161-1170

TOPIC TAGS: fluoride, neodymium, laser optic material, lanthanum compound, cerium compound, yttrium compound, barium compound, strontium compound, calcium fluoride, mixed crystal

ABSTRACT: The paper reports new results obtained from a study of the optical properties and induced emission at 300°K of a group of crystals of mixed fluorides containing a neodymium admixture. All the crystals contained from 0.5 to 2.0% Nd^{3+} and had the following composition: $\text{CaF}_2\text{-YF}_3$ (1, 2, 3, 7%); $\text{CaF}_2\text{-CeF}_3$ (7%); $\text{SrF}_2\text{-LaF}_3$ (30%); $\text{BaF}_2\text{-LaF}_3$ (30%). The absorption and luminescence spectra of the crystals at 300 and 77°K were studied. The synthesized mixed fluorides constitute a new type of laser materials. Structurally they are typical crystals, but from the standpoint of their spectral properties, they occupy an intermediate position between crystals and glasses. The thresholds of generation excitation were found to be much lower than in crystals.

UDC: 546.161:548.55

Card 1/2

L 45107-55

ACC NR: AP6023908

of pure fluorides, and the efficiency was found to be several times higher. The working concentrations of neodymium in the mixed fluorides are several times higher than in $\text{CaF}_2\text{-Nd}^{3+}$. The weaker concentration quenching is apparently due to the removal of the structural degeneracy of the optical centers. Migration of the excitation energy between various groups of In^{3+} optical centers is possible in the mixed fluoride crystals. The latter may prove effective as sources of excitation for semiconductor lasers. Orig. art. has: 7 figures and 2 tables.

SUB CODE: 20/ SUBM DATE: 30Dec65/ ORIG REF: 015/ OTH REF: 010

Card 2/2 JS

L 29104-66 ENT(1); FCC/FSS-2 GW
ACC NR: AR5018942

SOURCE CODE: UR/0269/65/000/007/0052/0052

AUTHOR: Mandel'shtam, S. L.; Vasil'yev, B. N.; Voron'ko, Yu. R.; Tindo, I. P.; Shurygin, A. I.; Fetisov, Ye. N. 43
B

ORG: none

TITLE: Studies of the shortwave end of the Sun's spectrum with the help of satellites and rockets

SOURCE: Ref. zh. Astronomiya. Otdel'nyy vypusk, Abs. 7.51.431

REF SOURCE: Tr. Kois. po spektroskopii. AN SSSR, v. 1, 1964, 36-54

TOPIC TAGS: sun, solar radiation intensity, solar radiation, solar corona

TRANSLATION: Experimental and theoretical studies were made of the Sun's radiation in the spectrum area of $\lambda < A$. It was established that this radiation has a continuous spectrum and is dependent on the recombination of electrons and "heavy" ions in the solar crown. Various tests of the electron temperature in radiation areas of the crown gave values within limits of $(1.5 - 4)10^6$ °K; the flow of radiation at the edge of the Earth's atmosphere is $(2-8)10^{-4}$ erg/cm²sec. References 15. Authors' resume.

SUB CODE: 03 / SUBM DATE: none

Card 1/1 CC

L 20581-66 T/ENP(t) IJP(a) ID/IN/IS

ACC NR: AP6002044

SOURCE CODE: GE/0030/65/012/002/0905/0912

AUTHOR: Bagdasarov, Kh. S.; Voronko, Yu. K.; Kaminskii, A. A.;
Krotova, L. V.; Osiko, V. V. 67
64
BORG: P. N. Lebedev Physical Institute of the Academy of Sciences of the
USSR, Moscow; Institute of Crystallography of the Academy of Sciences
of the USSR, MoscowTITLE: Modification of the optical properties of $\text{CaF}_2\text{-TR}^{3+}$ crystals
by yttrium admixtures. 2)

SOURCE: Physica status solidi, v. 12, no. 2, 1965, 905-912

TOPIC TAGS: optic crystal, crystal imperfection, crystal impurity,
yttrium compound, absorption spectrum, luminescence spectrum, equilib-
rium constant, fluoride, ionic crystal, rare earth elementABSTRACT: Absorption and luminescence spectra of $\text{CaF}_2\text{-Nd}^{3+}$ (type I)
(V. V. Osiko, Crystal growth, Encyclopadia, v. 5, Publishing House of
the Academy of Sciences SSSR, 1965) crystals were investigated as a
function of the concentration of added yttrium fluoride. The appear-
ance of new lines and a decrease in the line intensities because of
the addition of yttrium is attributed to a shift in the equilibrium of
Nd centers. Some possible models are discussed. The equilibrium of
centers of rare-earth ions (TR^{3+}) in the presence of yttrium fluoride
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L 20561-66

ACC NR: AP6002044

in $\text{CaF}_2\text{-Nd}^{3+}$ crystals was calculated approximately. The authors thank S. P. Afanasev and M. F. Limanovskaya for the growth of crystals and V. B. Aleksandrov for his help in the experiment. Orig. art. has: 4 figures and 2 formulas. [Based on author's abstract] [NT]

SUB CODE: 20/ SUBM DATE: 11Sep65/ ORIG REF: 008/ OTH REF: 005

Card 212 BK

VORON'KO, Yu.K.; KAMINSKIY, A.A.; OSIKO, V.V.; PROKHOROV, A.M.

Selective excitation of the centers of rare-earth ions in
crystals. Pis'. v red. Zhur. eksper. i teoret. fiz. 1 no.4:
33-39 My '65. (MIRA 18:11)

1. Fizicheskiy institut imeni Lebedeva AN SSSR i Institut
kristallografii AN SSSR. Submitted April 16, 1965.

VORON'KO, Yu. K.; KAMINSKIY, A.A.; OSIKO, V.V.

Effect of hard radiations on the optical centers of trivalent
rare earth ions in crystals. Pis'. v red. Zhur. eksper. i teoret.
fiz. 2 no. 10:473-478 N '65 (MIRA 19:1)

1. Fizicheskiy institut imeni Lebedeva AN SSSR. Submitted
September 29, 1965.

L 12995-66 EWT(1)/FCC/EWA(h) GW

ACC NR: AR6000794

SOURCE CODE: UR/0169/65/000/009/A013/A013

SOURCE: Ref. zh. Geofizika, Abs. 9A75

AUTHOR: Mandel'shtam, S. L.; Vasil'yev, B. N.; Voron'ko, Yu. K.; Tindo, I. P.;
Shurygin, A. I.; Fetisov, Ye. N.

TITLE: Using artificial satellites and rockets to study the short-wave end of the solar spectrum

CITED SOURCE: Tr. Komis. po spektroskopii. AN SSSR, vyp. 1, 1964, 36-54

TOPIC TAGS: solar radiation, artificial earth satellite, solar corona

TRANSLATION: Solar radiation was experimentally and theoretically studied in the spectral region with wavelengths shorter than 10 angstroms. It was found that the radiation has a continuous spectrum and is due to recombination of electrons and "heavy" ions in the solar corona. Various experimental measurements of the electron temperature in the radiating regions of the corona gave values lying between 1.5 and $4 \cdot 10^6$ Kelvin; the radiation flux at the boundary of the terrestrial atmosphere is $2-8 \cdot 10^{-4}$ erg/cm²·sec.

SUB CODE: 08, 22/
Card 1/1 Hw

UDC: 523.72:629.195.2:629.192.2/3

VORON'KO, Yu.K.; KAMINSKIY, A.A.; KORNIYENKO, L.S.; OSIKO, V.V.; PROKHOROV, A.M.; UDOVENCHIK, V.T.

Study of the induced radiation from $\text{CaF}_2\text{-Nd}^{3+}$ (type II) crystals at room temperature. Pis'. v red. Zhur. eksper. i teoret. fiz. 1 no.2:3-7 Ap '65. (MIRA 18:10)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta i Fizicheskii institut AN SSSR.

VORONILLO, Yu.A.; KALASHNIK, A.A.; SOLOV, V.V.; PROKHOROV, A.M.

Induced radiation of Ne^{3+} in CaF_2 at the wavelength $\lambda = 5512 \text{ \AA}$.
Fiz'. v. red. Zhur. eksper. teor. fiz. 1 no.1:5-8 Ap '65.

(MIRA 18:9)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR i Institut
yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

VORON'KO, Yu.K.; KAMINSKIY, A.A.; OSIKO, V.V.; KHAIMOV-MAL'KOV, V.Ya.

Optical homogeneity of $\text{CaF}_2 - \text{Nd}^{3+}$ laser crystals. Izv. AN
SSSR. Neorg. mat. 1 no.9:1521-1525 S '65. (MIRA 18:11)

1. Institut kristallografi AN SSSR i Fizicheskiy institut
imeni Lebedeva AN SSSR.

4470-00 4470-00 4470-00 4470-00 4470-00 4470-00 4470-00 4470-00 4470-00 4470-00
ACC NR: AP6001224 WG/GG SOURCE CODE: UR/0363/65/001/012/2038/2092

AUTHOR: Bagdasarov, Kh. S.; Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences USSR (Fizicheskiy institut Akademii nauk SSSR); Institute of Crystallography, Academy of Sciences SSSR (Institut kristallografii Akademii nauk SSSR)

TITLE: Fluoride-base systems as active quantum electronic materials

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 12, 1965, 2088-2092

TOPIC TAGS: laser, infrared laser, solid state laser, stimulated emission, fluoride base laser

ABSTRACT: Stimulated emission in the infrared spectral region (10,40 μ) has been achieved with a low generation threshold (about 50 J) from Nd³⁺ activated BaF₂-LaF₃ single crystals at room temperature. The crystals, described as a new laser material, were grown by Stockbarger technique from a BaF₂-LaF₃ mixture of variable composition with 1% NdF₃ addition. The growth technique was described earlier [Yu. K. Voron'ko, V. V. Osiko, V. T. Udovenchik, M. M. Fursikov. Fiz. tv. tela, 7, 267 (1965)]. Preliminary study of the absorption and luminescence spectra of the crystals indicated the characteristics required for laser, i.e., an unusually high absorption coefficient in the 0.6—1.0 μ region at 300K and the highest luminescence intensity

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UDC: 546.161

L 9498-66

ACC NR: AP6001224

peak at 1.05μ , corresponding to ${}^4F_{3/2} - {}^4I_{11/2}$ transition, also at 300K. The line width in the luminescence spectrum insignificantly increased with temperature increase from 77K to 300K. These favorable spectral characteristics were attributed to the distribution of Nd^{3+} ions between different types of electric crystal fields. Stimulated emission was excited with a Xe-flash lamp in single crystal rods (75 x 5.5 mm) in the cavity consisting of external confocal dielectric mirrors. The emission possessed usual laser characteristics as shown by the time dependence at different pumping energies. The physical properties of the crystals make possible a continuous laser emission at 300K. Orig. art. has: 4 figures. [JK]

SUB CODE: 20/ SUBM DATE: 13Jul65/ ORIG REF: 002/ OTH REF: 005/ ATD PRESS:

Card 2/2

L 12824-66 EWT(1) AT

ACC-NR: AP6001775

SOURCE CODE: UR/D:86/65/002/010/0173/0178

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Effect of hard radiation on the optical centers of TR^{3+} ions in crystals

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 10, 1965, 473-478

TOPIC TAGS: luminescence center, rare earth element, Gamma irradiation, crystal symmetry

ABSTRACT: The authors have observed a new effect, wherein the structure and optical properties of the TR^{3+} centers in crystals with TR^{3+} impurity are changed by hard radiation. The investigations were carried out with the crystals $CaF_2:Nd^{3+}$ (0.3 wt.%), $CaF_2:Er^{3+}$ (0.3 wt.%), and $CaF_2:Eu^{3+}$ (0.3 wt.%, type I), synthesized by a procedure described earlier (FTT v. 7, 267, 1965). The absorption spectra were obtained with a diffraction spectrometer. In all crystals, irradiation greatly reduced the intensities of some lines and gave rise to new lines. From a comparison of the absorption coefficients at the line maxima before and after irradiation it is easily seen that: 1) the lines comprising a single system are decreased in like fashion, and 2) the decrease is strongest in rhombic-symmetry lines and practically nil in the tetragonal system. It is concluded that γ irradiation changes the structure of the optical TR^{3+} centers, with some centers becoming disintegrated

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L 12824-66

ACC NR: AP6001775

and replaced by others of still unknown structure. Two possible mechanisms of TR^{3+} -center transformation are discussed. The ionic mechanism, which presupposes dissociation (destruction) of the centers, and the electron-hole mechanism, which is tantamount to formation of a center of a new type. It is still unclear which of these mechanisms predominates. It is noted in conclusion that the effect observed in this investigation can be used for an analysis of the optical TR^{3+} centers in crystals by observing the inhomogeneous change in the absorption-line intensity following irradiation. In addition, a study of the optical properties of the TR^{3+} centers in irradiated crystals can yield valuable information on the character of the processes which occur when hard radiation interacts with crystalline matter. Orig. art. has: 3 figures and 1 table. [02]

SUB CODE: 20/

SUBM DATE: 29Sep65/

ORIG REF: 004/

OTH REF: 003 ATD PRESS

4/83

Card

2/2

VORON'KO, Yu.K.; KAMINSKIY, A.A.; OSIKO, V.V.

Analysis of the optical spectra of Pr^{3+} , Nd^{3+} , Eu^{3+} , and Er^{3+} in fluorite crystals (type 1) by the method of concentration series. Zhur. eksp. i teor. fiz. 49 no.3:724-729 S '65. (MIRA 18:10)

1. Fizicheskiy institut imeni Lebedeva AN SSSR.

VORON'KO, Yu.K.; KAMINSKIY, A.A.; OSIKO, V.V.

Optical relaxation of Ho^{3+} and Er^{3+} ions in the CaF_2 lattice
(Type 1) in the visible range of wavelengths. Zhur.eksp.i
teor.fiz. 49 no.4:1022-1027 0 '65.

(MIRA 18:11)

1. Institut Kristallografi AN SSSR i Fizicheskiy institut
imeni Lebedeva AN SSSR.

VORON'KO, Yu.K.; ZVEREV, G.M.; PROKHOROV, A.M.

Induced radiation from Er^{3+} ions in CaF_2 . Zhur. eksp. i teor.
fiz. 48 no.6:1529-1532 Je '65. (MIRA 18:7)

1. Institut yadernoy fiziki Moskovskogo gosudarstvennogo univer-
siteta.

VORON'KO, Yu.K.; KAMINSKIY, A.A.; OSIKO, V.V.

Analysis of the optical spectra of CaF_2 — Nd^{3+} crystals (Type 1).
Zhur. eksp. i teor. fiz. 49 no.2:420-428 Ag '65. (MIRA 18:9)

1. Fizicheskiy institut imeni Lebedeva AN SSSR.

L 5040-66

EWI(l)/EWT(m)/T/EWP(t)/ENF(b) LJP(c) JD/JS/CG

ACC NR: AP5026588

SOURCE CODE: UR/0056/65/049/004/1022/1027

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Onikov, V. V.

ORG: Institute of Crystallography, Academy of Sciences, SSSR (Institut kristallografi Akademii nauk SSSR); Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskii institut Akademii nauk SSSR)

TITLE: Optical relaxation of Ho^{3+} and Er^{3+} ions in the CaF_2 lattice (Type I) in the optical wavelength region

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 4, 1965, 1022-1027

TOPIC TAGS: laser, lifetime, calcium bifluoride, holmium ion, erbium ion, nonradiative transition, luminescence spectrum, absorption spectrum, rare earth ion

ABSTRACT: The lifetimes of the $5S_2$ and $5F_5$ excited states of Ho^{3+} and the $4S_{3/2}$ and $4F_{9/2}$ states of Er^{3+} in CaF_2 host crystals (activator concentration 0.01—2% by weight) were investigated in the range of temperatures of 77—300K. An analysis made of the influence of non-radiative transitions on the reduction of lifetimes of the excited states included a discussion of the possible causes of the failure

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L 5040-66

ACC NR: AP5026588

to obtain generation in the yellow-green of the spectrum of $\text{CaF}_2:\text{Er}^{3+}$ at 77K. The samples were cut from crystals into cylindrical rods of various lengths. The ends were polished. Emission was excited by a stroboscopic lamp, and a photomultiplier with a multiple alkali metal cathode was employed for oscilloscope display. The experiments showed a shortening of the excited state lifetimes with increasing concentrations of Ho^{3+} and Er^{3+} ions in CaF_2 , which may be explained by a mutual dipole-dipole magnetic interaction of the ions. At room temperature, nonradiative transmissions, which significantly shorten the lifetimes of spontaneous transmissions, played an essential part. In the case of $\text{CaF}_2:\text{Er}^{3+}$, an anomalous dependence of lifetimes on the concentration was found for the $^4\text{S}_{3/2} \rightarrow ^4\text{I}_{15/2}$ transition at 77K. Orig. art. has: 5 figures. [2L]

SUB CODE: 55,0P/ SUBM DATE: 08Apr65/ ORIG REF: 005/ OTH REF: 005

ATD PRESS: 4/32

CC
Card 2/2

ACC NR: AP5025788 SGTB/LJP(c) RU/AN SOURCE CODE: UR/0363/65/001/009/1521/1525

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Khairov-Mal'kov, Y. Ya.

ORG: Institute of Crystallography, Academy of Sciences, USSR (Institut kristallografi
Akademii nauk SSSR); Physics Institute im. P. N. Lebedev, Academy of Sciences, USSR
(Fizicheskii institut Akademii nauk SSSR)

TITLE: Investigation of the optical inhomogeneity of $\text{CaF}_2:\text{Er}^{3+}$ laser crystals

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 9, 1965, 1521-1525

TOPIC TAGS: laser, solid state laser, laser rod, laser crystal, fluorite, fluorite
laser, optical inhomogeneity, excitation threshold

ABSTRACT: Experiments were performed to determine the effect of different types of
optical inhomogeneities on the excitation threshold of CaF_2 laser rods doped with 0.5%
 Nd^{3+} . Crystals 150 mm long with a 15-mm diameter were grown from the same melt under
identical conditions and had the same concentration of active impurities. Thirteen
laser rods, each about 73 mm long and 6.5 mm in diameter, were fabricated from the crys-
tals. Measurements of the excitation threshold, the gradient of the index of refrac-
tion, the local inhomogeneities, and small angle scattering showed that the optical de-
fects differed from crystal to crystal. These differences were attributed to minute,
uncontrollable variations in the temperature regime during the growth process and to
differences in the crystallographic orientation of the growing crystals. It was estab-

Card 1/2 UDC: 546.411.61.548.55

L 3725-66

ACC NR: AP5025788

lished that the scattering angle of a beam from a He-Ne laser directed along the geometrical axis of the rod shows the greatest amount of correlation with the excitation threshold of the laser rod. This parameter should therefore be used in selecting the $\text{CaF}_2:\text{Nd}^{3+}$ crystal rods to be used in lasers. Orig. art. has 4 figures and 1 table.

SUB CODE: SS/ SUBM DATE: 02Jun65/ ORIG REF: 008/ OTH REF: 000/ ATD PRESS: 4/20 [CS]

Card 2/2

VORON'KO, Yu.K.; OSIKO, V.V.; UDOVENCHIK, V.T.; FURSIKOV, M.M.

Optical properties of CaF_2 - Dy^{3+} crystals. Fiz. tvar. tela 7 ,
no.1:267-273 Ja '65. (MIRA 18:3)

1. Fizicheskiy institut imeni Lebedeva AN SSSR, Moskva.

VORON'KO, Ye.Z.; KROTOVA, L.V.; CSIKO, V.V.; UDOVENCHIK, V.T.; FURSIKOV, M.M.

Optical properties of $\text{CaF}_2 - \text{Nd}^{3+}$ crystals. Fiz. tverd. tela
7 no.6:1800-1807 Ja '65. (MIRA 18:6)

1. Fizicheskiy institut imeni Lebedeva AN SSSR, Moskva.

L 2329-66

ACCESSION NR: AP5024560

6
were in the form of cylindrical rods with polished ends (parallel within 10--20"), each ~75 mm long and ~6.5 mm in diameter. Confocal external mirrors were used which had an ~0.9% transmission at 1.06 μ . The mirrors were 20 mm in diameter and had a radius of curvature of 500 mm. The linewidths at ~10461 Å and ~10640 Å were ~0.8 cm⁻¹ and ~3 cm⁻¹, respectively, at 300K. The most intense luminescence was due to the ⁴F_{3/2} → ⁴I_{11/2} transition, and the lifetime of the excited ⁴F_{3/2} state of a CaF₂—YF₃ crystal with a 0.5% Nd³⁺ concentration at 300K was ~1 msec. The results show further that the generation in the described system occurs at a considerably lower threshold than in the case of known crystals based on fluorine compounds. Among previously investigated active media, only CaWO₄:Nd³⁺ and Gd₂O₃:Nd³⁺ are known to lase at two wavelengths at 300K with lower thresholds. Orig. art. has: 3 figures. [YK]

ASSOCIATION: Fizicheskiy Institut im. P. N. Lebedeva (Physics Institute); Institut kristallografi AN SSSR (Institute of Crystallography, AN SSSR)

SUBMITTED: 07 May 65

ENCL: 00

SUB CODE: EC

NO REF SOV: 004 27
Rare Earth Compounds

OTHER: 002

ATD FREES: 4/107

Card 2/2 (BeA)

AUTHOR: Voron'ko, Yu. K.⁴⁴; Kamenskii, A. A.⁴⁴; Osiko, V. V.⁴⁴

TITLE: Analysis of optical spectra of CaF_2 -Nd³⁺ crystals

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 2, 1964, p. 420-428

TOPIC TAGS: laser, fluorite/laser, neodymium doped laser, laser emission spectrum, paramagnetic laser

ABSTRACT: The "concentration series" method was used for the spectral analysis of rare-earth ions in type-1 CaF_2 crystals. The designation "type-1" was taken from the crystallochemical classification of V. V. Osiko (Rost kristallov, 5, Izd. AN SSSR, 1965). The aim of the analysis was to determine the suitability of Nd³⁺ as a laser medium. The results of the analysis show that the Nd³⁺ ion is suitable for use as a laser medium in type-1 CaF_2 crystals. The analysis also shows that the Nd³⁺ ion is suitable for use as a laser medium in type-1 CaF_2 crystals. The analysis also shows that the Nd³⁺ ion is suitable for use as a laser medium in type-1 CaF_2 crystals.

are outlined in more detail. The absorption spectra at 77 and 4.2°K showed sharp features and their intensities were measured. The fluorescence spectra were measured at 77°K, and the intensity of the fluorescence lines of varying width appeared at the lower temperature. Luminescence spectra were taken at 77°K only, and at wavelengths of 300-400 mμ.

I 63088-65
ACCESSION NR: AP5021102

comparisons of the number of absorption lines observed, as a function of the temperature, and the theoretical predictions for the number of lines observed at different temperatures. The results show that the number of lines observed is in good agreement with the theoretical predictions.

ASSOCIATION: Fizicheskii Institut im. P. N. Lebedeva Akademii nauk SSSR Physics Institute, Academy of Sciences, USSR

NO REF SOV: 010

Card 3/3

L 2129-66 ENT(m)/EPT(c)/ENP(t)/ENP(b) IJP(c) JD/JW/G

ACCESSION NR: AP5024688

UR/0056/65/049/003/0724/0729

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.

TITLE: Analysis of optical spectra of Pr^{3+} , Nd^{3+} , Eu^{3+} , and Er^{3+} in fluorite crystals by the "concentration series" method

40
38
13

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 3, 1965, 724-729

TOPIC TAGS: fluorite, fluorite spectrum, doped fluorite, doped fluorite spectrum, admixture spectrum, dope spectrum, spectral analysis, absorption spectra, luminescence spectra

ABSTRACT: A new experimental method for the analysis of absorption and luminescence spectra of type-1 CaF_2 crystals with admixtures of rare-earth ions (TR^{3+}) is described and the investigation results are discussed. The crystal classification is that of V. V. Osiko (Rost Kristallov, 5, Izd. AN SSSR, 1965). The designation "concentration series" refers to the staggered admixture concentration in the set of samples used for the investigation. The method is based on the difference in the character of concentration dependence of various admixtures. This character is specific for structurally different admixture centers as a function of the

Card 1/3

L 2129-66

ACCESSION NR: AP5024688

overall concentration of the rare-earth admixture in the crystal at equilibrium temperature. Thus, at low concentrations the greatest number of TR^{3+} ions are found in cubic centers. With an increased concentration, the tetragonal centers increase and exceed the number of cubic centers at a concentration of 10^{-3} . A further concentration leads to an increasing proportion of rhombic centers. The concentrations investigated ranged from 0.003 to 2% by weight of each kind of admixture. Special care was taken to insure perfect uniformity of the specimens (except for admixture concentrations) and even distribution of the centers. Preliminary studies of absorption spectra were carried out at 77K by the SP-700 spectrophotometer within the 0.185 to 2.5 μ range. Further investigations concerned the selected line groups most convenient for study. The absorption in these groups was determined by the DFB-12 diffraction spectrometer with a 0.1 \AA resolution at 77K. A photomultiplier with an oxygen-cesium photocathode was used to detect the light pulses which were amplified and recorded by an EPP-09M1 potentiometer. The concentration series of absorption curves thus obtained clearly displayed a redistribution of line intensities with the increase of concentration of a given admixture. The peak values of absorption coefficients were then determined for each spectral group. The dependence of absorption coefficients on concentration, charted in the double logarithmic scale, showed families of parallel curves of distinct character, each family representing a

Card 2/3

L 2129-66

ACCESSION NR: AP5024688

different kind of admixture. A similar intensity redistribution effect was obtained in the investigation of the luminescence spectra. A strong reabsorption of resonance lines, however, prevented a quantitative evaluation. By combining the analysis by the concentration series method with spectrum study at helium temperatures it is possible to construct the pattern of energy levels for each type of center. To identify the specific line groups with definite center structures however, the concentration series method must be used in combination with some other method. Orig. art. has: 4 figures. [7P]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 10Mar65

ENCL: 00

SUB CODE: SS, OF

NO REF SOV: 006

OTHER: 002

ATD PRESS 4/17

Card 3/3

L 58467-65
ACCESSION NR: AP5014193

mounted confocal dielectric mirrors (radius of curvature, 500 mm; diameter, 40 mm; transmissivity, 99.999%). At 100.3-6 kexon lamp was used for pumping. Laser emission resulted from the interaction of the laser beam with the sample. The lifetime of the excited state at 3000 Å was measured with a timer developed for this purpose as 0.25 nsec. At 3000 Å, the type II laser operates at a lower frequency of 1000 Å than any other known neodymium laser. Orig. art. has: 1 table and 2 figures [10]

ASSOCIATION: Institut yadernoy fiziki Moskovskogo Gosudarstvennogo universiteta (Institute of Nuclear Physics, Moscow State University); Fizicheskyy Institut Akademii nauk SSSR (Physics Institute, Academy of Sciences, USSR)

SUBMITTED: 01/19/77

INTL: 00

SUB CODE: EC 53

NO REF SCV: 002

OTHER: 0018

ACT PERIOD: 4015

Card 2/2

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu
Prilozheniye, v. 1, no. 4, 1965, 11-19

TOPIC TAGS: laser material, rare earth, absorption spectrum, Stark effect

ABSTRACT: The active medium in most solid-state lasers today is a crystal doped with rare-earth ions. For various reasons such crystals behave quite differently, and this study analyzes rare-earth active centers to determine the optimum conditions. A method is proposed for studying the Stark structure of the luminescence spectra of rare-earth doped crystals (in this case $\text{CaF}_2\text{-Er}^{3+}$) in which the dual lines of centers are used as a reference. The experimental setup consists of a mercury lamp, a monochromator, a glass filter, quartz light conductors, test sample, prism, and a spectrograph. The monochromator is capable of selecting a band with a width of 0.1 Å from a very narrow spectrum.

Card 1/2

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ACCESSION NR: AP5014227

Both static and dynamic methods are used in producing excitation: In the first, excitation is produced in a preselected absorption line; in the second, the wave-lengths of the excitation light are scanned. The dynamic luminescence spectra for

the complex of Er^{3+} and H_2O are shown, and the results of

the analysis of the spectra are discussed. The results are compared with those

obtained for the complex of Er^{3+} and H_2O in the presence of a

complexing agent. The results are compared with those obtained for the

complex of Er^{3+} and H_2O in the presence of a complexing agent.

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complexing agent. The results are compared with those obtained for the

complex of Er^{3+} and H_2O in the presence of a complexing agent.

ACCESSION 75-

URI/2181, 55/007/006/1809/1-07

~~SECRET~~

TITLE: Oxygen Properties
TOPIC TAGS: absorption spectrum
Cyanide activity

ABSTRACT: Optical methods were used to investigate a large number of Chalcogenide crystals, grown by different techniques. The absorption and fluorescence spectra of these crystals were measured and compared with those of the corresponding bulk materials. The results show that the optical properties of these crystals are very similar to those of the bulk materials. The fluorescence spectra of these crystals were also measured and compared with those of the corresponding bulk materials. The results show that the fluorescence spectra of these crystals are very similar to those of the bulk materials.

TITLE: Stimulated emission from Er^{3+} ions in CaF_2

SOURCE: Zhurnal eksperimentov i teoreticheskoy fiziki, v. 48, no. 6, 1964
1529-1532

TOPIC TAGS: stimulated emission, fluorescence, laser, erbium, calcium fluoride

ABSTRACT: The authors obtained stimulated emission from Er^{3+} ions in CaF_2 crystals and a laser in CaF_2 at room temperature. The observed laser emission is in the near infrared region, at a wavelength of 1.63 μ . The laser is pumped by a He-Ne laser at 633 nm. The laser output is in the form of a continuous wave. The laser is characterized by a high efficiency and a low threshold current. The laser is suitable for use in a variety of applications, including optical communication and optical computing.

ACCESSION NR. A1311000

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. N.; Osimo, V. V.; Prokhorov, A. M.

TITLE: Stimulated emission of $\text{CaF}_2: \text{Ho}^{3+}$ at λ 5512 Å

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 1, no. 1, 1965, 5-9

TOPIC TAGS: laser, calcium fluoride, calcium fluoride laser, stimulated emission, coherent light fluoride

ABSTRACT: The present article, in the form of a letter to the editors, provides preliminary data on a $\text{CaF}_2: \text{Ho}^{3+}$ laser operating in the middle of the visible spectral range at 5512 Å at a temperature of 77K. The films of the 1.5-cm-long CaF_2 crystal were doped with a dielectric material. The diameter of the laser cavity was 1.5 cm. The oscillation threshold was 100 mW. The laser action was observed between the $^5\text{F}_5$ level and a state close to the ground level. The output power was 10 mW. The laser action was observed at 5512 Å. The laser action was observed at 5512 Å. The laser action was observed at 5512 Å.

Card 1-2

L 45720-65

ACCESSION NR: AP5013663

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva, Akademii nauk SSSR (Physics
Institute, Academy of Sciences USSR); Institut yadernoy fiziki, Moskovskiy
darsatelnyy universitet (Inst. of Nuclear Physics of Moscow State Univ.)

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NO REF-BOY: 002

ENCL: 00

OTHER: 00

SUB CODE: OP

ATD FROM: 4001

Card

2/2

ROGOV, Yu.G.; ROGOVA, V.P.; VORONEGV, A.A.; MOLEVA, V.A.

New mineral "tinacsit" $\text{NaK}_2\text{Ca}_2\text{TlSi}_7\text{O}_{19}(\text{OH})$. Dokl. AN SSSR 162
no.3:658-661 My '65. (MIRA 18:5)

1. Institut mineralogii, geokhimii i kristalloghimii redkikh
elementov AN SSSR. Submitted December 28, 1964.

VORONKOV, A.; CHARNYY, S.; KASTEL, I.; KRESTOV, M.; MOISEYENKO, A.;
~~PALLADINA, G.A., red.izd-va; TOKER, A.M., tekhn.red.~~

[Industrialization of finishing work; a report] Industrializatsiya
otdelochnykh rabot; soobshchenie...[Moskva, Gos.izd-vo lit-ry po
stroit. i arkhitekt., 1955] 29 p. (MIRA 11:6)
(Building)

VORONKOV, A.

527N/5

831.2

Dvorets Nauki (Palace of Science, By) A. Voronkov (1) S. Balashov
(Moskva) Moskovskiy Rabochiy, 1954.
238 P. illus.

.V9

VORONKOV, A., inzh.

A useful book for miners ("Safety measures in coal
mines" by I.F. Maunkin, Reviewed by A.Voronkov).
Bezop.truda v prom. 4 no.8:35 Ag '60.

(MIRA 13:8)

(Coal mines and mining—Safety measures)

VORONKOV, A., inzh.; KLEMENT'YEV, Yu., inzh.

Under the banner of our country. IUn.tekh. 6 no.12:14-16 D '61.
(Merchant marine) (MIRA 14:12)

VORONKOV, A.

Along the unbeaten track. IUn. nat. no.6:4-6 Je '61.

(MIRA 14:7)

1. Leningradskaya oblast, poselok Tosno.
(Tosno—Agriculture—Experimentation)

VORONKOV, A.

Purple pearl. IUn.nat. no.7:8-9 J1 '62.

(MIPA 15:3)

1. Nikol'skaya shkola, Leningradskaya oblast'.
(Beans) (Children in agriculture).

1. VOPONKOV, A., Eng.

2. USSR (600)

4. Karaganda Basin - Coal Mines and Mining

7. Achievements of mixed brigades in the Karaganda coal basin. Mast.ugl. N_o. 10 1952.

9. Monthly List of Russian Accessions, Library of Congress, April 1953, Uncl.

PIKALOV, A. (Aktyubinsk); VORONKOV, A. (g.Dorogobuzh); GRIGORYAN, L.;
GRINEV, A. (Chelyabinsk); SVISTUNOV, A. (Chelyabinsk)

On the fighting stand. Pozh.delo 5 no.7:27: Jy '59.
(MIRA 12:9)

1. Starshiy inspektor Upravleniya pozharney okhrany Armenii
(for Grigoryan).
(Firemen)

VORONKOV, A.

~~SECRET~~
New standards for ship repairs. Mor. flot 15 no.6:18-20 Je '55.
(Ships--Maintenance and repair) (MIRA 8:8)

VORONKOV, G. Y., and KUZHMAN, G. I.

"Kinetics of the Process of Drying of Fine Peat."

Report submitted for the Conference on Heat and Mass Transfer,
Minsk, BSSR, June 1961.

VORONOV, A. A. Cand Med Sci -- (diss) "Catheterization of heart cavities
in the diagnosis of congenital ^{diseases} ~~diseases~~ of the heart and ^{large} ~~large~~ vessels."
Len, 1958. 15 pp (1st Len Med Inst im Academician I. P. Pavlov), 200 copies
(KL, 52-58, 106)

-111-

VORONKOV, A.A.; BATALIYEVA, N.G.; PYATENKO, Yu.A.

Crystalline structure of stilwellite. Kristallografiia 9 no.4:
553-554 J1-Ag '64. (MIRA 17:11)

1. Institut mineralogii, geokhimii i kristallokhemii redkikh
elementov AN SSSR.

PYATENKO, Yu.A.; VORONKOV, A.A.

Formula of gagarinite. Zhur.strukt.khim. 3 no.6:720-721 '62.
(MIRA 15:12)

1. Institut mineralogii, geokhimii i kristalloghimii redkikh
elementov.

(Minerals)

(Crystallography)

70-3-2-23/26

AUTHOR: Voronkov, A.A.

TITLE: ~~Growth of Single Crystals of Sulphate Hemihydrates~~
(Vyrashchivaniye monokristallov semivodnykh sul'fatov)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 2, pp 240 - 243
(USSR).

ABSTRACT: Crystals with the chemical formula $MSO_4 \cdot 7H_2O$, where $M = Mg, Ni$ or Zn were studied. All crystals have the same space group $P2_12_12_1 = D_2^4$. In order of decreasing solubilities they are $ZnSO_4 \cdot 7H_2O$, $(Mg, Zn)SO_4 \cdot 7H_2O$, $MgSO_4 \cdot 7H_2O$, $NiSO_4 \cdot 7H_2O$. All these sulphates are characterised by the existence of a large number of different crystalline hydrates. The form with 7 molecules of water is stable only below a certain temperature. Crystals were most satisfactorily grown dynamically in a crystalliser on 1-2 litres capacity stabilised to 0.05° with a thermostat at $33-35^\circ C$. Zinc and magnesium sulphate seeds, supported on plastic tables were grown at this temperature and nickel sulphate at less than $30.5^\circ C$. A rod-shaped nucleus was also satisfactorily used to grow crystals

Card 1/2

Growth of Single Crystals of Sulphate Hemihydrates 70-3-2-23/26

between two plastic plates. Relative growth rates were found to be Mg sulphate parallel to c 4, perp. to c 1.5; Zn sulph. par. to c 2.5, perp. to c 1.2; Ni sulph. par. to c 1.4, perp. to c 0.7. Mixed crystals produced from solutions containing 50 mol% of the relevant components had the compositions $5\text{MgSO}_4 \cdot 6\text{NiSO}_4 \cdot 77\text{H}_2\text{O}$ and $5\text{ZnSO}_4 \cdot 6\text{MgSO}_4 \cdot 77\text{H}_2\text{O}$.

In air at room temperature all the crystals effloresced. There are 3 figures and 6 references, 4 of which are Soviet and 2 German.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow State University im. M.V. Lomonosov)

SUBMITTED: September 4, 1957

Card 2/2

SOV/70-3-6-10/25

AUTHOR: Voronkov, A.A.

TITLE: The Piezoelectric, Elastic and Dielectric Properties of Crystals of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (P'yezoelektricheskiye, uprugkiye i dielektricheskiye svoystva kristallov $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 6, pp 716-719 (USSR)

ABSTRACT: Crystals of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ are orthorhombic with class 2:2 , They occur as epsomite. Synthetic crystals were prepared which showed the forms (010), (111) and (010). The structure breaks up at 48.2°. Optical goniometric measurements agree well with those in Groth. Dielectric measurements made at 1 kc/s gave:

$$e_{11} = 5.40 \pm 0.06, \quad e_{22} = 5.23 \pm 0.03, \quad e_{33} = 5.79 \pm 0.05.$$

A capacity bridge and three plates cut perpendicular to the axes were used. Elastic constants were measured by a resonance method. For the s_{ik} coefficients (i,k = 1,2,3) plates of oblique X, Y and Z cuts were used and longitudinal compression/extension oscillations were excited. The compliances found were:

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SOV/70-3-6-10/25

The Piezoelectric, Elastic and Dielectric Properties of Crystals
of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

$$s_{11} = 5.26 \pm 0.10 \times 10^{-12}$$

$$s_{22} = 6.22 \pm 0.01$$

$$s_{33} = 5.69 \pm 0.01$$

$$s_{44} = 13 \pm 0.05$$

$$s_{55} = 6.23 \pm 0.10$$

$$s_{66} = 12.07 \pm 0.02$$

$$s_{12} = -2.68 \pm 0.01$$

$$s_{13} = -1.70 \pm 0.02$$

$$s_{23} = -2.47 \pm 0.01$$

Their temperature coefficients over the interval
 $10^\circ - 30^\circ$ were found to be:

$$Ts_{11} = 6.32 \times 10^{-4}$$

$$Ts_{22} = 8.68$$

$$Ts_{33} = 10.36$$

$$Ts_{44} = 12.30$$

$$Ts_{55} = 9.62$$

$$Ts_{66} = 7.95$$

$$Ts_{12} = 13.67$$

$$Ts_{13} = -0.88$$

$$Ts_{23} = 8.21$$

Card2/3

The Piezoelectric, Elastic and Dielectric Properties of Crystals
of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

SOV/70-3-6-10/25

The piezoelectric moduli were determined by the difference between the resonant and anti-resonant frequencies for plates of three cuts $X-45^\circ$, $Y-45^\circ$ and $Z-45^\circ$. The accuracy is not better than about 5%. In c.g.s.u. they are $d_{14} = -6.0 \pm 0.3 \times 10^{-8}$, $d_{25} = -7.2 \pm 0.3$, $d_{36} = 10.8 \pm 0.3$. The signs of these piezoelectric moduli were found from static experiments on a cube. Acknowledgments to Academician A.V. Shubnikov. There are 4 figures and 4 references, 2 of which are Soviet and 2 German, and 1 table.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im.
M.V. Lomonosova (University im. M.V. Lomonosov)

SUBMITTED: April 25, 1958

Card 3/3

ZHABIN, A.G.; VORONKOV, A.A.; KHALEZOVA, Ye.B.; KAZAKOVA, M.Ye.

New data on accessory davidite from the Vyshnevyye Mountains
in the Ural Mountains and the so-called "ufertite" and
"ferutite." Trudy IMCRE no.15:110-120 '63. (MIRA 16:11)

VORONKOV, A.A.; PYATENKO, Yu.A.

Crystal structure of vlassovite. Kristallografiia 6 no.6:937-
943 N-D '61. (MIRA 14:12)

1. Institut mineralogii, geokhimi i kristalloghimi redkikh
elementov.

(Silicates)
(Crystallography)